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CLOUD ASSISTED GPS TRACKING FOR SCHOOL CHILDREN USING WEBCAM

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Abstract: This project presents a student safety and monitoring system designed to provide real-time location tracking, health status updates, and enhanced security measures in educational settings. The system utilizes an Node MCU, GPS modules, RFID reader, temperature sensor, and a webcam. Real-time location data and health readings are communicated via SMS alerts. The RFID component determines the student's presence within the school bus or campus. Crucially, the webcam enables photo and flash, providing visual verification of the student's environment for immediate response in emergencies. In case of abnormal temperature readings or if the student triggers an emergency alert, the system delivers timely notifications to parents. This integrated solution offers a comprehensive approach to student safety, leveraging technology to improve monitoring capabilities and facilitate swift interventions when necessary.

Keywords: Node MCU, GPS, RFID, Web cam, Temperature sensor

1) INTRODUCTION

Student safety is a priority for parents, educators, and communities. However, traditional monitoring methods often fall short in providing real-time information, comprehensive oversight, and rapid response capabilities. This project presents a cutting-edge solution that leverages technology to revolutionize student safety procedures. At its core, this system integrates an Node MCU with GPS tracking, an RFID reader, a temperature sensor, an emergency switch, and a camera. These components work together to monitor student location, health status, and emergency situations. SMS alerts instantly notify parents or guardians of abnormal temperature readings or emergency signals, along with precise location data. The camera provides crucial visual context for informed decision-making and timely response coordination. This project aims to bridge the limitations of conventional safety methods. By harnessing technology, it delivers real-time awareness, proactive health monitoring, and direct communication capabilities. Ultimately, this innovative system has the potential to create a safer, more responsive learning environment for students.

2) LITERATURE SURVEY

Sunil kumar, Ravi "Child safety and tracking system (CSATS)" Designed in April 2023, this child tracking system aims to provide parents with real-time monitoring capabilities. It combines an ESPCAM32 microcontroller, GPS functionality, and image capture. The system is compact and placed within the child's belongings. Parents initiate tracking by sending a "/START" message through the Telegram app. The device responds by transmitting the child's current location (including latitude and longitude), along with images of the area. Parents can easily pinpoint their child's whereabouts by entering the coordinates into Google Maps.

Emad Badawy, Aly Elhakim, Ahmed Abdulhamid "AN IOT BASED SCHOOL BUS TRACKING AND MONITORING SYSTEM" Smart education extends beyond the classroom, and a significant factor impacting a child's learning experience is their daily commute on the school bus. Internet of Things (IoT) technology offers innovative solutions to monitor this often-overlooked aspect of a child's day. A proposed IoT-based system aims to provide real-time visibility into the safety and comfort conditions within school buses. This system connects directly to the bus's internal systems, transmitting data such as environmental factors and location via 3G/4G and MQTT protocols. This collected data generates comprehensive reports for parents, schools, and regulatory bodies, ensuring transparency and accountability

Ninad Tanksale, Ajay Vedpathak , Amey Panse "Cloud Based Child Tracking System Using Raspberry Pi" Child safety concerns have prompted the need for advanced security measures, especially during school transportation. In 2015, a solution was proposed that integrates smart technology into traditional tracking systems. This system has three core elements: a school bus unit, a school unit, and an Android app designed for parents.

3) EXISTING SYSTEM

While basic RFID systems offer a way to track objects or individuals using RFID cards, they often fall short in several key areas. They may not provide precise, real-time location tracking, the ability to monitor health indicators, or offer live video feeds for immediate situational awareness. Furthermore, many lack a robust system for sending proactive alerts to parents or guardians. Similarly, standalone GPS trackers, while useful for location monitoring, don't typically include health sensors or have direct integration with a parental notification system

4) PROPOSED SYSTEM

Our system goes beyond basic tracking by incorporating crucial elements for comprehensive student safety. A temperature sensor enables proactive health monitoring, allowing parents to take early action in case of potential illness. In emergencies, the live video streaming camera offers invaluable situational awareness, adding a visual layer to traditional location-based data. Students themselves can trigger emergency alerts, ensuring rapid response and pinpointing the exact location where help is needed. This integration of features prioritizes both preventive measures and swift interventions. The temperature sensor promotes early detection, while the camera allows for real-time assessment during crises. Student-activated alerts put the power to request help directly in their hands. Combined, these elements aim to create a safer educational environment where student well-being is paramount. Our system's innovative approach offers proactive monitoring and comprehensive protection when it matters most.

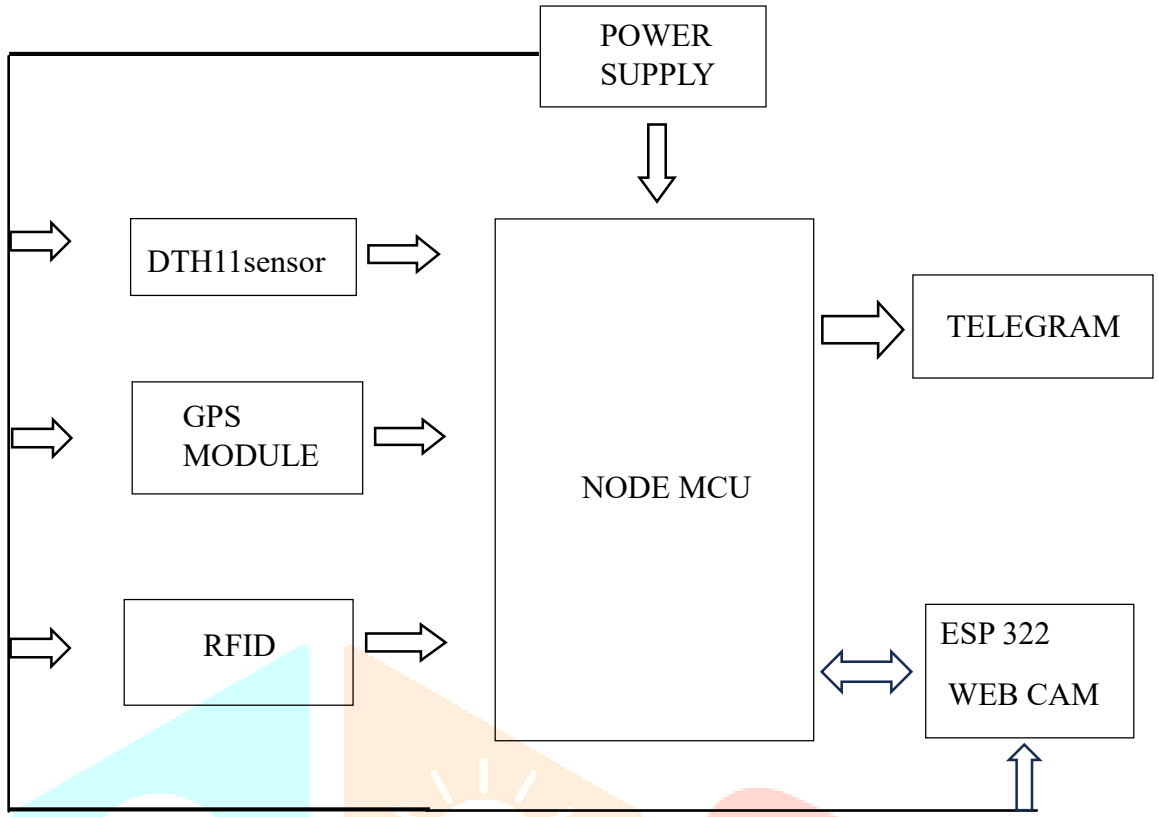


Fig 2: Block diagram of Proposed System

GPS module:

GPS (Global Positioning System) is a network of satellites that provides location and time data anywhere on or near Earth, regardless of weather conditions. This system currently consists of 24 satellites strategically positioned in orbit, traveling at impressive speeds. To pinpoint a location on Earth, a GPS receiver needs data from at least three satellites. Often, a fourth satellite is used to cross-check the information and increase accuracy. Technological advancements have led to compact GPS modules with built-in processors and antennas. These modules receive and interpret satellite signals, allowing them to determine your position and the precise time.

Figure 3. GPS module

RFID reader:

RFID labels are miniature integrated circuits composed of specialized chips and connection components. Within an RFID label's chip, four key parts work together: the digital control unit, data storage, the radio frequency (RF) interface circuit, and the resonant circuit. The resonant circuit is vital for communication, allowing the label to receive energy and data from the reader's antenna. The RF interface then provides power, timing, and data to the internal circuitry. It effectively bridges the external antenna with the label's digital control unit and data storage.

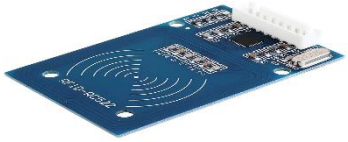


Figure 4. RFID reader

RFID ID Card :

An RFID ID card functions as a miniature transponder, containing a substrate, a chip, and an antenna. The substrate acts as the foundation, holding all the components together. The antenna is crucial for communication, transmitting and receiving signals to and from an RFID reader. The embedded chip stores unique identification data. When a reader scans the card, it gathers this data and a timestamp, storing it in a database. Special software then interprets this raw data, making it useful for a variety of applications. RFID cards often use thin, flexible plastic for the substrate, but some may employ a more rigid material.

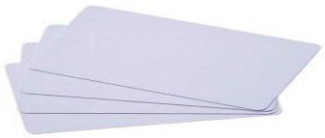


Figure 5. RFID card

NODE MCU:

The Node MCU is a tiny, low-cost, open-source IoT (Internet of Things) platform based on the ESP8266 Wi-Fi module. It's like a mini-computer that can connect to the internet and interact with other devices. You can use it to build projects like home automation systems, weather stations, or even simple robots. It is famous because it is easy to use and program, especially for beginners.

Figure 5. NODE MCU

Temperature sensor:

The DHT11 temperature and humidity sensor is a popular choice for monitoring both temperature and humidity levels in various settings. Its affordability, reliable readings, and compact size make it suitable for everything from HVAC systems and environmental monitoring stations to hobbyist projects and smart home devices.

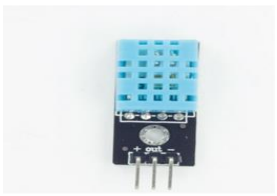


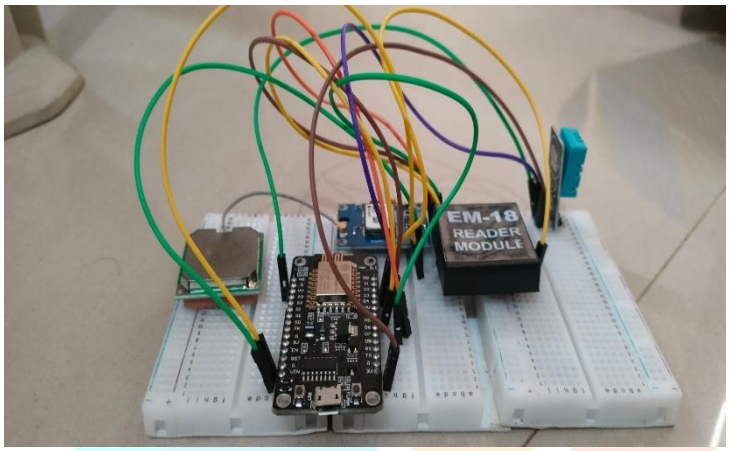
Figure 6. Temperature sensor

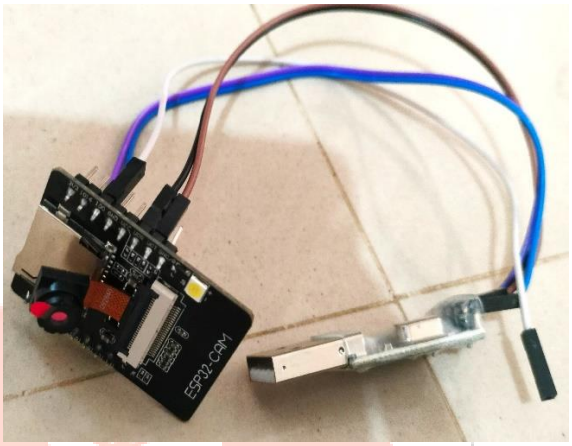
Web Camera:

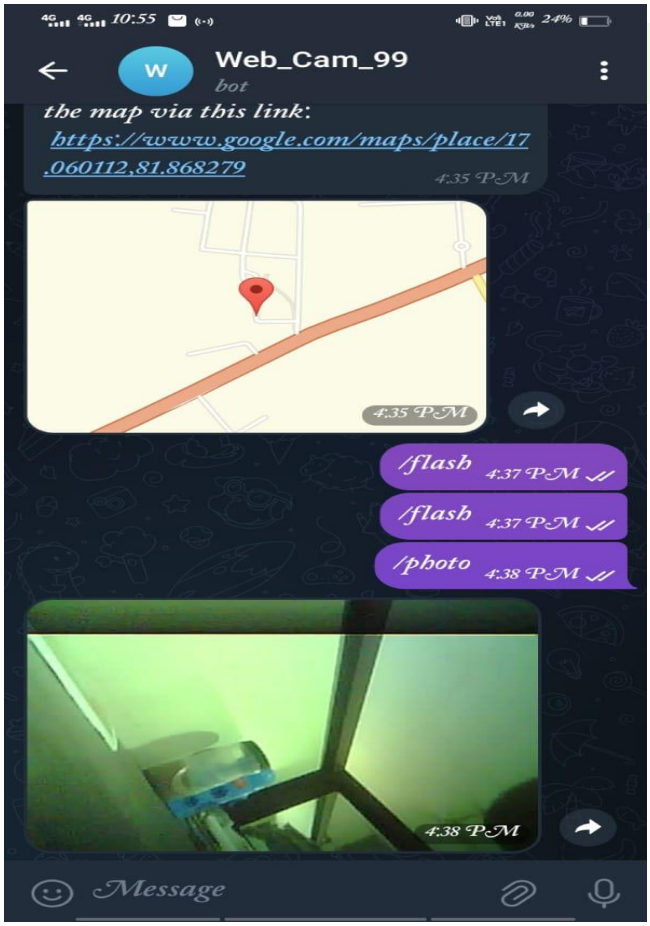
The ESP32-CAM is a compact and energy-efficient camera module built around the ESP32 chip. It features an OV2640 camera and includes a TF card slot for onboard storage. The ESP32-CAM's versatility makes it ideal for a range of smart IoT applications. These include wireless video surveillance, remote image uploads via Wi-Fi, and QR code recognition.

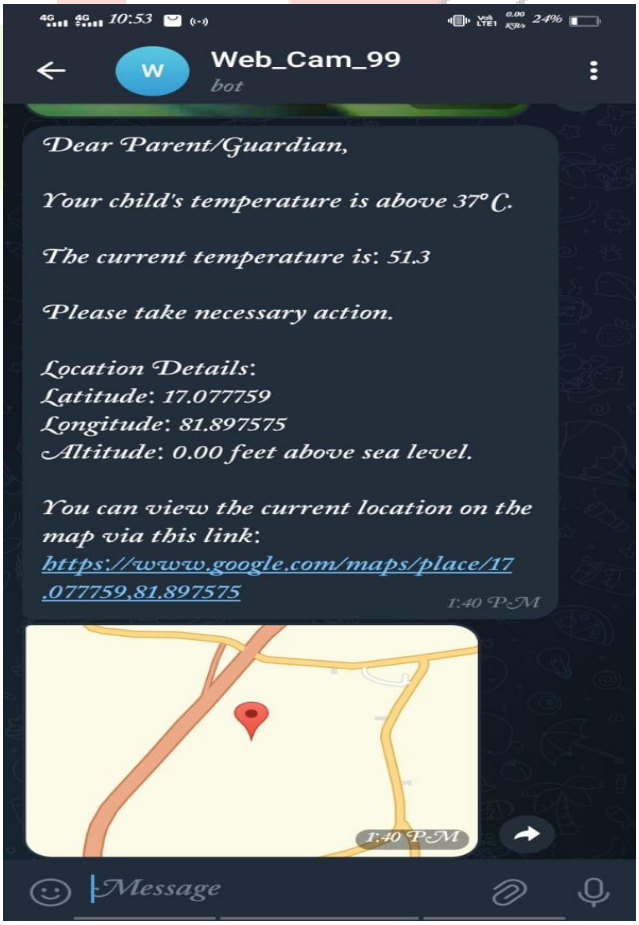
Figure 7. Web Camera

5) RESULTS









6) CONCLUSION

The proposed student safety and monitoring system demonstrates a robust and multifaceted approach designed to address pressing concerns within educational environments. Combining automated attendance tracking, health monitoring, location-aware alerts, and the groundbreaking addition of flash to easy identification in dark places and photo in day light, this project marks a significant advancement over existing systems. It promotes timely interventions, proactive communication between schools and parents, and enhances overall security measures.

7) FUTURE SCOPE

Convenience and efficiency are gained by using long-range RFID readers to record student attendance at school entrances. By automating attendance tracking, it lessens possible errors and administrative strain. Notifying parents through text message guarantees accountability and real-time communication. But issues with data security, privacy, and possible system failures must be addressed. Such technology integration also necessitates a large infrastructure and training expenditure. However, with proper administration, this technique can improve parent-school communication and expedite attendance monitoring.

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